Thermophysical Properties of Multicomponent Mixtures of Aliphatic Alcohols

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An experimental investigation of the thermophysical properties of normal alcohols, their binary and multicomponent solutions in different aggregate states is of both important practical and theoretical interest. In this work, results of comprehensive study conducted over many years of P-V-T and Ps -Ts dependences, and dependence of viscosity on the state parameters, over a wide range including single-, two- phase and critical regions for the homologous normal alcohols from methanol up to decanol, and their binary and multicomponent solutions are presented. The experiments studying P-V-T and Ps - Ts dependences were conducted in a facility using the constant - volume piezometer method.

Temperature range: from 298 K up to temperature of thermal decomposition of substances under consideration. Pressure range: 0.1 - 60 MPa.

The errors of measurements of specific volume for the single-phase state and pressure are within 0.08% and 0.05%, respectively. The error of measurement of temperature is within 0.01 - 0.02 K. For the two- phase and critical regions, the errors are increasing and are within 0.8 - 1% for the specific volume measurements. The solutions were made by weighing chemically pure components on analytical scales. The viscosity of the solutions under study was measured in an absolute facility using capillary viscosimeter. The errors of viscosity measurements for the liquid, and vapor states and critical region are within 1.5%, 2 - 2.5%, 3%, respectively.

An analytical description of the P-V-T dependences includes finding of solutions to the system of equations consisting of: a) theoretical equation of state for vapor and b) modified equations of state for the liquid state and critical region. The experimental viscosity results were described by the some new equations linking temperature, pressure and concentration dependences of the thermophysical properties of solutions under investigation. For the specific volume and viscosity, virial coefficients are derived from the proposed equations and the relations. For the vapor states these coefficients are established. Some conclusions on the behavior of specific volume and viscosity of the normal alcohols in critical region were made.